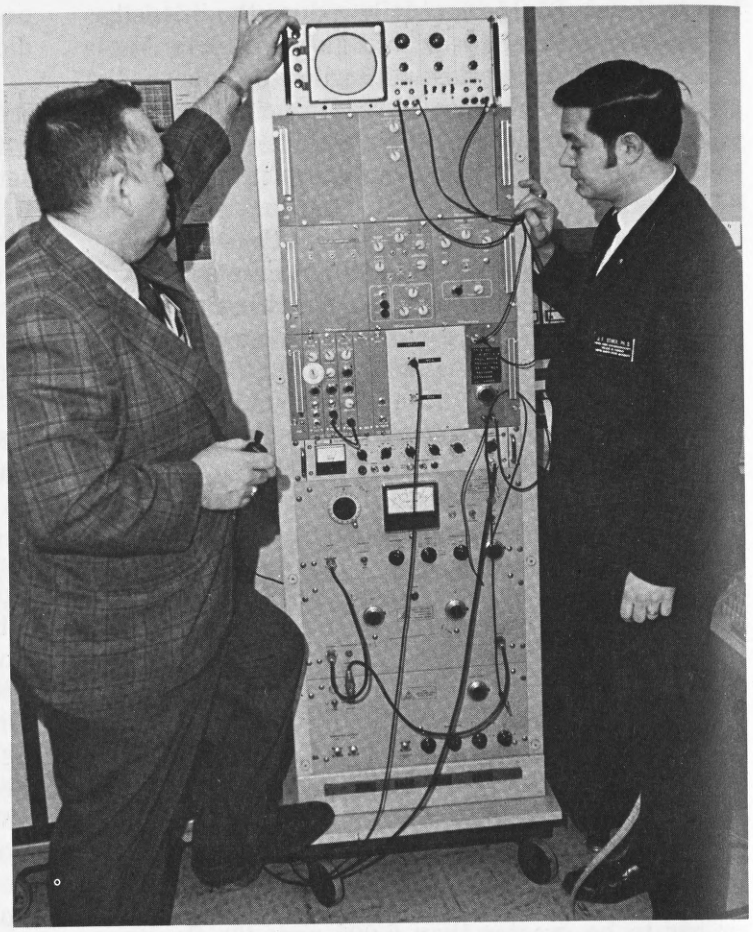

Dr. Vacik, left, and Dr. Stiver work with the multi-channel analyzer to measure radioactivity in environmental contamination.

The Pro's and Con's of Nuclear Electric Power

James F. Stiver and James P. Vacik

Much has been written and said within the past year relative to the use of nuclear power in electric generating plants. Many of the statements have been made amid heated debate, some have been wild guesses or poor estimations, others have been based on solid scientific research data. What is the real problem and what is the best approach to the solution are two questions which need to be answered.

If population estimates and other trends are examined, the first of these questions is not hard to understand and answer. Basically, the electrical power requirements for this country have, up until now, been doubling every 10 years. No letup in this trend can be seen as the public continues to demand more lights with greater intensities, more electronic gadgetry, more TV's, hi-fi's, electric tools, on down to electric tooth brushes, air conditioners, humidifiers, and the like.

Not only is the United States faced with this type of "progressive" increase in power needs, but the population is growing at a rate of some 42,000 people each week. This means that by 1980 the population will have increased by some 25 million people, all demanding these same "progressive" increases, plus more autos, houses, schools and jobs.

Right now in this country some 7,000 kilowatt-hours per person per year are required to fill

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The material contained herein was derived in part from information contained in hearings of the Joint Committee on Atomic Energy, 91st Congress of the United States, August 1969.

this demand. By 1980, this demand is expected to increase to about 11,500 kilowatt-hours per person per year. This means that the electric power industry must increase its total power capacity from about 300 million kilowatts at present to about 600 million kilowatts by 1980 and up to a projected 1,300 million kilowatts by the year 2000. This, of course, will only be solved by more electric generation plants.

The real problem, then, is what type of plant must be built in quantity; nuclear, hydro, oil, coal, gas or other. Obviously, some of each of these will be constructed, but one type is going to have to be emphasized more than the others to meet the need.

When energy production is examined critically in all its forms—autos, jet planes, coal-fired electric plants, home heating plants and even hydroelectric plants—major pollution is found in each. Only within recent years has anyone critically examined pollutants and their effects on population. An increase in metropolitan death rates over rural death rates at least strongly suggests that the risk of so-called common pollutants is not insignificant.

The common pollutants produced by fossil-fueled electrical plants are listed in Table 1.

Table 1. Fossil-fueled Power Plants Pollutants Produced Per Day Per 1,000 MWe Emmission in Tons/Day.

Pollutant	Coal	Oil	Gas
Oxides of Sulfur	220-250	85	0.002
Oxides of Nitrogen	33- 80	35	19
Carbon Monoxide	1.0	0.01	none
Particulates	7.2	1.2	0.75

In addition to these pollutants, fossil-fuels produce discharges of radioactive materials in various quantities to the air through their stacks. These radioactive pollutants come from quantities of uranium or thorium found, for example, in coal. Radioactive materials in coal are equal to about 1/50th that produced by the same size nuclear-powered electrical plant. The amount of radioactive pollutants from oil or gas is less, of course, than that of coal. These combined radioactive and non-radioactive pollutants are a hazard when expanded to meet our power needs if, for example, we were to use all coal-fired units.

If we base the major type of power to use solely on pollution, we would choose gas-fired units. Unfortunately, if the world were to utilize the members of the petroleum family alone for the main source of power, the middle 80 per cent of the ultimate resources would be exhausted in about 100 years.

If coal were to be utilized in the same way, the time required to exhaust the middle 80 per cent of the ultimate resource would be between 100 and 200 years. Because of other factors, all these fossil-fuels must be conserved. They are needed to power such units as aircraft and to be utilized by the chemical industries to produce lubricants, plastics, drugs and such other vital necessities.

With these points in mind, it appears that the only logical solution lies in nuclear power as our major electrical power source. If this thought is critically examined, it would be found that the radioactive pollution from a nuclear-powered electrical plant is in fact 50 times greater than that from a coal-fired plant. The nuclear plant, however, doesn't produce all the noxious chemical pollutants produced by the fossil-fuels. Indeed, the operation of a nuclear-powered plant is in many respects far cleaner.

Such a plant is probably one of the few units in existence which could locate its water intake for the plant 1,000 yards downstream from its sewage discharge point and continue to operate. Imagine what such a situation would do to one of our cities, or to a paper mill, chemical plant or refinery. While radioactivity from nuclear plant discharges may be said to be a problem, the relatively high level of radioactive discharge everyone talks about is still only 1/100th the amount that radiation experts have said is tolerable by man.

The other big problem frequently cited against nuclear-powered electric plants is thermal pollution. It seems that the water coming from such a plant is some 25 to 30 degrees warmer than the intake water. In North Dakota this might really be a welcome advantage. Irrigating fields with this water could retard frost and/or extend the growing season, it could keep ice off a given body of water, or otherwise be utilized for its heating effects.

Finally, what about exhausting this type of fuel in time? It has been estimated that this source of power could be maintained for hundreds to thousands of times longer than all the fossil-fuels combined.

Until something better comes along, nuclear power for our electrical plants apparently must be increased for our own welfare. The risks of pollution from nuclear energy sources are better known now than for any other pollutants. Only reasonable control and surveillance need be utilized, coupled with sound reason and imaginative vision to make nuclear power sources a reality.